An unsustainable future

Submission to Senate Economics Committee Inquiry into the Renewable Energy (Electricity) Amendment Bill 2009

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The Federal Government has proposed a target of 20 per cent renewable electricity by 2020. This requires about 6,000MW of additional deliverable power for a projected total energy demand of 260,000GWh in 2020.

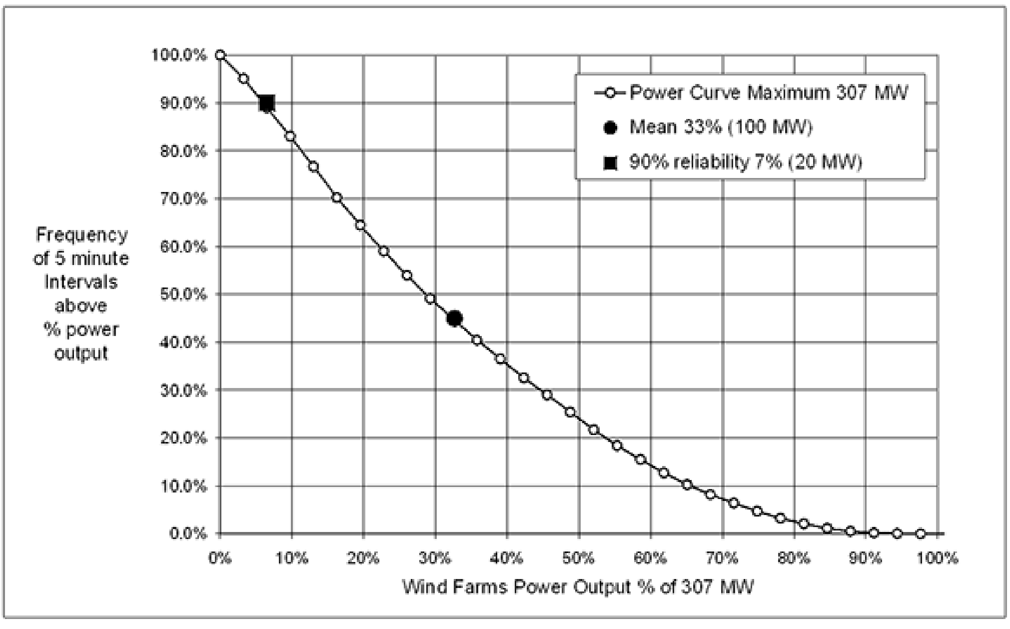
It is difficult to imagine any carbon free technology readily deployable and able to provide this except for nuclear power and wind. Since the government will not consider nuclear power, wind power is the technology of choice.

So is there a possible solution?

The NEMMCO (National Electricity Market Management Company) Statement of Opportunity for 2007 projects requirements out to the year 2017-18. Taking the NEMCO projections as a base and adding the extra years to 2020 gives a need for 11,000MW of new generation. It appears the NEMMCO technology of choice would be gas turbine generators. Gas turbines have about one third of the carbon dioxide emissions of coal fired generators. This would be added to an existing 45,000MW of established coal, oil, gas and hydro power generation.

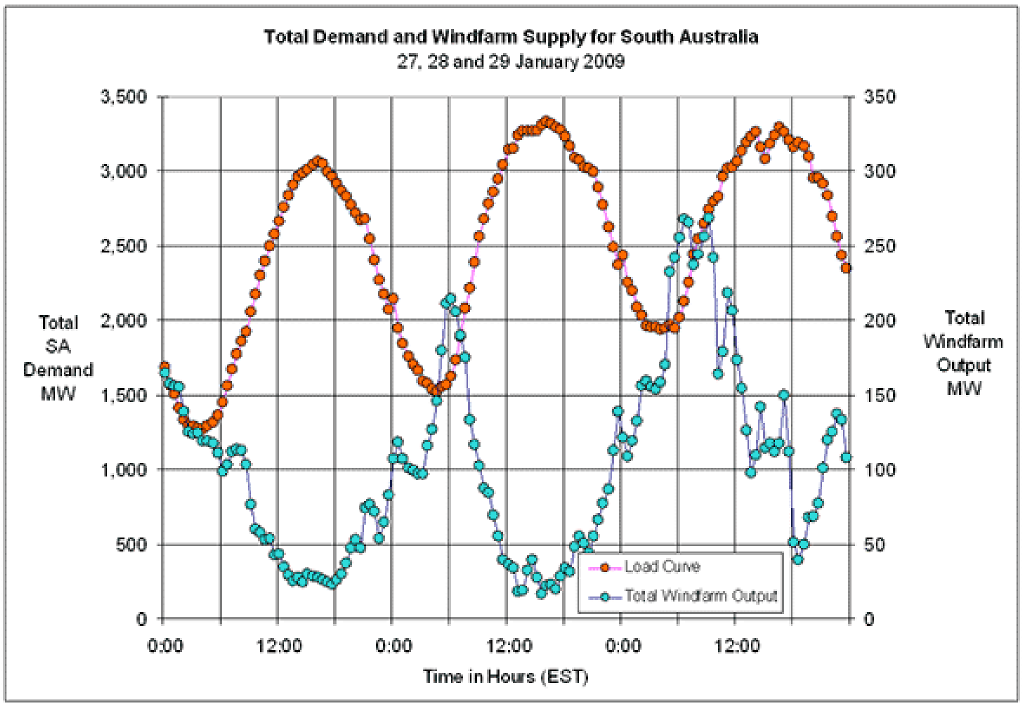
Gas turbines can meet base load demand and are most effective in following fast changing demand so how would wind power fit into these projections?

Wind power is intermittent. It is known to be intermittent across South Australia and Victoria where the performance has been measured. An example of the behaviour over a period of one year is shown below. The data is from 5 wind farms spread across a distance of some 500 kilometres in South Australia. This suggests that the spread and separation of wind farms in South East Australia will not make their combined average output or reliability very much better than an individual wind farm. This is not surprising when weather systems have dimension of over 1,000 kilometres.



***Wind farm reliability**: power curve for South Australian wind farms from July 1, 2006 to June 30, 2007. The capacity factor or average output is 33 per cent of total capacity of 307MW. The 90 per cent reliability figure is 7 per cent.*

Wind power cannot be relied on to supply substantial peak demand power and has a limited potential for replacing base load power with some contribution for peak demand times. A striking illustration of this is shown below where in a heat wave, a time of maximum demand, there was a minimal contribution from 6 well separated wind farms.



***Wind intermittency**: South Australian wind farm performance during a January 2009 heat wave. This is the sum of the output of six wind farms with a total capacity of 388MW. Total South Australian wind farm capacity is 740MW. There is little contribution from wind power during peak demand times, 7 per cent of installed capacity.*

The intermittency of wind means that to supply an average of 6,000MW of power requires installing 20,000MW of wind power taking the average output of wind farms to be 30 per cent of installed capacity.

For 2MW for a wind turbine, this is a building program of 10,000 wind turbine towers; that is two towers each day for 12 years. This would have to parallel the installation of 9,000MW of gas turbine generators. This is after allowing a 10 per cent reliability contribution for the 20.000MW of wind power. This program doubles the cost of supplying the extra energy from gas turbines alone. It is an increased expenditure of $34,000 million over 12 years! The present wind farm development has added a few hundred MW each year so the target does not look achievable either physically or financially.

How well would the electricity network cope with this change in energy source? First the electricity grid systems would need substantial enhancement to cope with highly variable and dispersed sources of energy. At a cost of $2 million per kilometre it could mean a further cost in the billions for new transmission lines.

Then there is the consideration of whether the system could cope with variations of energy from 0MW to 20,000MW as the wind varies. The answer is almost certainly “no” without heavy costs in keeping thermal generators in reserve or in standby mode. There is then the issue of whether the thermal generators are able to ramp up their output to compensate for falling wind energy. It can possibly be done with extraordinary coordinated management of coal, gas and hydro generators.

The best match for wind power is hydroelectricity with about 9,000MW of installed power but only some 3,500MW in the Snowy with the rest dispersed throughout the states. However, hydro is used in meeting peak energy demands so the management of limited water resources would present a challenge.

In addition it is an economic folly where the use of natural gas would substantially reduce carbon dioxide emissions, provide energy when needed and save some $40 billion in expenditure.

So it might be better to follow the example of the United Kingdom where, in 1992, they made a "Dash for Gas" and converted thermal power stations from coal to natural gas? But if you also follow the present British Government's thinking then if their ambitious target for renewables is not achievable, there will be a need for more gas generation capacity.

This however would be a misuse of a vital industrial feedstock. So why not turn to nuclear power, after all uranium is only useful for its energy content?

In summary, the proposal for renewable power is unachievable. It is unachievable in terms of installation, present transmission network capacity and present market operation. It may also be a mis-direction of economic resources.